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NEPHRECTOMY: ITS INDICATIONS AND CONTRAINDICATIONS.[1]

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Of 233 cases of extirpation of the kidney which I have collated from public and private[2] sources of information 129 recovered, and 104, or 44.63 per cent., died. Of the entire number, 111 by the lumbar incision indicate 70 survivals and 41 deaths, the mortality being 36.93 per cent., while of 120 by the ventral incision 59 recovered, and 61, or 50.83 per cent., perished. In the remaining 2 cases, both of which proved fatal, the nature of the operation is uncertain.

It is thus to be perceived that the fatality of the abdominal operation is greater by 13.90 per cent. than that of the lumbar operation, a difference which several distinguished laparotomists ascribe to the removal of healthy kidneys after a wound of the loin, or for some condition in which they are not diseased. This statement is, however, incorrect. For ureteral fistulæ, rupture of the ureter, protrusion through the loin, a painful condition, and excessive mobility, healthy or injured kidneys have been removed in 39 cases. Of these, 19 were by the lumbar incision, with 4 deaths, or

[1] Read before the American Surgical Association, April 21, 1885.

[2] Of the 34 unpublished nephrectomies utilized in the preparation of this paper, I have to thank Bardenheuer for 14, Czerny for 6, Martin for 3, Bantock for [illegible]vage for 2, Marcus Beck for 2, Elder for 1, Kœnig for 1, Henry Morris for 1, and Thomas Smith for 1. I have also to express my thanks to Knowsley Thornton for a list of 11 nephrectomies, 3 nephrolithotomies, and 4 nephrotomies; to Lawson Tait for a list of 3 nephrectomies and 12 nephrotomies; to Bryant for 13 nephrotomies; to Savage for 2 nephrotomies; to Peruggi for all the nephrectomies done in Italy; to Tscherning for all the nephrectomies performed in Copenhagen; to Barker for all the nephrectomies done at the University College Hospital; to Gaillard Thomas for notes of his 3 cases of nephrectomy; to Hicquet for the termination of his case of nephrectomy for sarcoma; to Pepper for an unpublished nephrolithotomy; to Israel for an unpublished nephrotomy; and to Henry Morris for 1 unpublished nephrolithotomy, 2 exploratory operations for renal calculus, 3 nephrotomies, and for many references to all of these operations. It should be stated that the statistics are brought up to May 15, and that cases reported merely as doing well several days after operation are excluded.

a mortality of 26.31 per cent., and 20 by the ventral incision, with 8 deaths, or a mortality of 40 per cent. The greater success of the lumbar operation is also shown by a comparison of the two methods for diseased kidneys. Thus, if we omit the 39 cases just referred to, along with 5 in which the organ or ureter was injured during the extirpation of abdominal tumors, or the kidney was inseparably attached to uterine or retroperitoneal tumors, 92 lumbar operations indicate 37 deaths, or a mortality of 40.21 per cent., and 95 abdominal operations show 48 deaths, or a mortality of 50.52 per cent. The nature of the disease for which the kidney is extirpated, however, influences the result, since we find that the mortality is less by 25, 16.17, 8.67, and 19.41 per cent., respectively, for suppurative lesions, hydronephrosis, painful floating kidney, and malignant growths, while it is greater by 39.56 per cent., for tubercular kidney, after the lumbar operation. Hence, we may conclude in a general way that the lumbar operation is the safer.

The following table of the causes of death after the lumbar and abdominal methods shows at a glance not only the dangers of nephrectomy, but the comparative frequency of the different causes after each operation:—

Causes of Death.	Abdominal.	Percentage.	Lumbar.	Percentage.
Shock	20	32.79	16	40.00
Peritonitis	13	21.31	1	2.50
Septic peritonitis	8	13.11	0	
Uræmia	4	6.55	2	5.00
Exhaustion	4	6.55	4	10.00
Septicæmia and pyæmia	3	4.91	7	17.50
Anuria	2[1]	3.27	6[2]	15.00
Infarction	2	3.27	0	
Hemorrhage	4	6.55	0	
Secondary hemorrhage	1	1.63	1	2.50
Suppuration of opposite kidney	0	. . .	1	2.50
Vomiting	0	. . .	1	2.50
Convulsions	0	. . .	1	2.50
	61		40[3]	

From the above comparison it appears that peritonitis, septic peritonitis, pulmonary embolism, primary hemorrhage, and uræmia are more common causes of death after abdominal extirpation of the kidney than after lumbar, and that shock, exhaustion, septicæmia, pyæmia, anuria, secondary hemorrhage, suppuration, convulsions, and vomiting are more frequent causes of death after lumbar nephrectomy than after abdominal. In other words, by selecting the lumbar operation the risks of peritonitis are reduced to a minimum, septic peritonitis is unheard of, as are also pulmonary embolism

[1] The opposite kidney was diseased in one.
[2] The opposite kidney was diseased in four.
[3] The cause of death is unknown in one.

and primary hemorrhage, which were the causes of upwards of six-tenths of the deaths after the abdominal operation.

Such are the general statements in regard to nephrectomy; but to draw any conclusions as to the real value of this grave operation, it must be considered in connection with the various diseases or lesions for which it has been performed, and compared with other modes of treatment. From an extensive acquaintance with the literature of the subject, I have been long convinced that the kidney has been too frequently removed; and it is for this reason, as well as for the purpose of comparing the relative value of nephrectomy, nephrotomy, nephrolithotomy, nephrorrhaphy, and other surgical measures, and concluding which of these operations should be resorted to in particular cases, that I have undertaken the present inquiry.

1. *Suppurative Lesions.*—For pyonephrosis, pyelitis, and abscess, including one example of abscess after a shot wound, and one of suppuration following traumatic rupture, the kidney has been removed 50 times,[1] with 28 recoveries and 22 deaths, or a mortality of 44 per cent. Of the 40 lumbar operations, 26 recovered and 14, or 35 per cent., succumbed, while of the 9 ventral incisions, 2 recovered and 7, or 77.77 per cent., died. The remaining one case, in which the nature of the operation is unknown, proved fatal. The cause of death was determined in 20, of which 5 were from shock, 2 from shock and disease of the remaining kidney, 4 from septicæmia, and 1 each from pyæmia, primary hemorrhage, secondary hemorrhage, uræmia, suppression of urine, vomiting, peritonitis, convulsions, and exhaustion. In 1 of the fatal lumbar operations the pleura was wounded, while in 2 the peritoneal cavity was opened, and one recovered. In 8 cases the kidney had been previously drained by nephrotomy, and 7 recovered.

Incision with drainage of suppurating kidneys has been practised in 72 cases,[2] of which 59 recovered and 13, or 18.02 per cent., died; 67 were by the lumbar incision, with 12 deaths, and 5, in the hands of Lawson Tait, were by the ventral incision, of which 1 perished. Of the 59 survivors, sinuses or fistulæ persist in 19, or 32.20 per cent.

[1] The operators were Bardenheuer in 12 cases; Czerny in 7 cases; Tait and Von Bergmann, each in 2 cases; Barwell, Beck, Clementi, Couper, Dandridge, D'Antona, De Vecchi, Dumreicher, Duncan, Elder, Frattina, Israel, Kidd, Lange, Lloyd, Marsh, Ollier, Palmer, Roberts, Savage, Stockwell, Studsgaard, Von Bruns, Von Mandach, Weir, West, and Whitehead, each in 1 case.

[2] The operators were Bryant in 9 cases; Tait in 7 cases; Thornton in 4 cases; Barker, Gardner, Morris, Parker, and Wheelhouse, each in 2 cases; and Angelini, Baker, Bardenheuer, Barwell, Beck, Burrell, Callender, Crane, Czerny, Datillo, Elder, French, Goodridge, Gueterbock, Holmes, Israel, Ker, Keys, Krannhals, Kuester, Landau, Lange, Lente, Lister, Lucas, Ollier, Paterson, Puzey, Raffa, Reeves, Roddick, Rosenberger, Savage, Southey, Studsgaard, Van Buren, Von Bergmann, Von Muralt, Weir, West, Williams, and Wright, each in 1 case.

For calculous pyelitis, nephrectomy has been done 23 times,[1] with 13 recoveries and 10 deaths, or a mortality of 43.47 per cent. Of the 16 operations through the loin, 9 recovered and 7, or 43.75 per cent., perished, while of the 7 ventral operations, 4 recovered and 3, or 42.85 per cent., died. The cause of death was shock in 4, shock and disease of the opposite kidney in 1, anuria in 2, the other kidney being involved in one, and exhaustion, peritonitis, and pyæmia each in 1. Previous nephrotomy had been resorted to in 4, all of which recovered.

Nephrotomy for calculous pyelitis has been resorted to 21 times,[2] with 12 recoveries and 9 deaths, or a mortality of 42.85 per cent. Of the recoveries a sinus remained in 1, and in 1, a case of Bryant's, a urinary fistula persists at the end of eight years.

It will thus be seen that of 73 nephrectomies for suppurative lesions from all causes, 41 recovered and 32, or 43.97 per cent., died. Of 93 nephrotomies, on the other hand, 71 recovered and 22, or 23.65 per cent., died. It, moreover, appears that of 12 nephrectomies after a previous nephrotomy only 1, or 9.33 per cent., succumbed, while of 61 nephrectomies without preliminary incision and drainage, 31, or 50.81 per cent., perished. In other words, the mortality of removal of the kidney for suppurative conditions is nearly twice as great as after nephrotomy, and a preliminary nephrotomy diminishes the risks of nephrectomy by 41.48 per cent. Hence, we may conclude that a suppurating kidney should never be excised until after the failure of nephrotomy, the only inconvenience of which is that a permanent sinus or urinary fistula remains in 29.57 per cent. of the recoveries, either of which may, however, should it prove a source of discomfort, be remedied by subsequent lumbar extirpation of the shrunken sac, with the risk of only 9.33 per cent. In favor of a preliminary nephrotomy, it is also to be declared that it enables us to determine with almost a certainty the condition of the opposite organ, that is to say, if, after a few days of drainage, pus ceases to appear in the urine, the probability is that the other kidney is sound.

2. *Tubercular Kidney.*—The kidney has been extirpated for so-called strumous disease 20 times,[3] of which 12 recovered, and 8, or 40 per cent., died—3 from exhaustion, along with disease of the opposite kidney in one, and tubercle of the bladder in one, 2 from shock, 2 from suppression of

[1] The operators were Barker, Godlee, and Thornton, each in 2 cases; and Bantock, Barwell, Bottini, Israel, Lange, Macewen, McClelland, Müller, Novaro, Rosenbach, Simon, Thomas Smith, Sonnenburg, Tait, Urbinati, Von Bergmann, and Wright, each in 1 case.

[2] The operators were Bryant in 2 cases, and Anderson, Baker, Beck, Callender, Clark, Couper, Cullingworth, Dawson, Durham, Haward, Hulke, Ingalls, Israel, Jones, Mynter, Richardson, Rose, Seymour, and Studsgaard, each in 1 case.

[3] The operators were Thornton in 3 cases, and Baker, Bantock, Beck, D'Antona, Elder, Golding-Bird, Jowers, Lucas, Martin, May, O'Reilly, Peters, Raffa, Tscherning, Von Muralt, Wright, and Wylie, each in 1 case.

urine, in both of which the remaining organ was similarly affected, and 1 from tubercle of the opposite kidney and of the lungs. Of the 13 operations through the loin 6 recovered, and 7, or 53.84 per cent., succumbed, while of 7 ventral operations 6 recovered, and 1, or 14.28 per cent., died. Previous nephrotomy had been resorted to in 8, with 5 recoveries and 3 deaths, or a mortality of 37.5 per cent., whereas primary extirpation was attended with a mortality of 41.66 per cent. In 10 of the recoveries in which the fate of the patient is known, 1 expired in four months from tubercle of the opposite kidney, 1 received no benefit, the bladder and remaining organ being diseased, while 8 were living and well at the expiration, respectively, of two months and twenty days, five months, five months, ten months, twenty-six months, thirty months, three years, and nearly four years.

It will thus be seen that in 7 of the 20 cases there was tubercle of the opposite kidney in 4, of the bladder in 1, and general tuberculosis in 2. Hence, present experience shows that tubercle is limited to a single kidney in only 65 per cent. of all cases, which renders the prognosis far more grave after nephrectomy than after removal of the kidney for suppurative lesions from ordinary causes. In the 8 cases of preliminary nephrotomy relief was not afforded; so that it appears as if previous incision might be wisely refrained from, and the kidney be extirpated in the early stage of tubercular disease, especially as excision may relieve the patient of a source of general infection. In performing the operation we ought, if possible, to ascertain the condition of the opposite organ; and as this may be done by the ventral incision, which is attended with a mortality of 14.28 per cent., as against 53.84 per cent. for the lumbar operation, we may conclude that primary exploration and removal by the abdominal incision is the proper procedure for the early stage of tubercular kidney. In advanced cases, on the other hand, especially if the morbid changes be not limited to the kidney, nephrectomy is clearly unjustifiable, and nephrotomy should be resorted to.

3. *Hydronephrosis.*—There are 21[1] recorded cases of nephrectomy for hydronephrosis, including 5 due to calculi, the case of Heywood Smith being omitted as the result is unknown. Of these 21, 13 recovered, and 8, or 38.09 per cent., died. Of 17 ventral operations, 10 recovered, and 7, or 41.17 per cent. succumbed, while of 4 lumbar operations, 3 recovered, and 1, or 25 per cent., died. Of the survivors, 2 had been subjected to nephrotomy, and a fistula remained in 1. The cause of death was shock in 3, peritonitis in 2, septic peritonitis in 2, and anuria from disease of the opposite kidney in 1.

[1] The operators were Thornton in 3 cases; Bardenheuer, Czerny and D'Antona, each in 2 cases; and Billroth, Cullingworth, Day, Goodell, Heath, Le Dentu, Kehrer, Savage, Schede, Spiegelberg, Thiersch, and Thomas, each in 1 case.

Incision with drainage of hydronephrotic kidneys has been practised in 25 cases,[1] of which 21 recovered, and 4, or 16 per cent., perished. Of 14 ventral incisions, 11 recovered, and 3, or 21.42 per cent., died, while of 11 lumbar incisions, 10 recovered, and 1, or 9.09 per cent., died. Of the 20 survivors, urinary fistulæ persist in 11, or 55 per cent. In one of these cases, Mr. Henry Morris writes me that about ten ounces of urine are passed daily into a receiver adapted to the loin, and that the patient suffers neither inconvenience nor discomfort. In a second case, recorded by Taylor, the ruptured sac was stitched to the abdominal wound, and the patient passes urine freely through a glass tube, much to her discomfort. In the cases of Le Dentu and Spiegelberg the trouble was remedied by removal of the kidney.

Of the remaining operations for hydronephrosis, 15 cases of puncture, of which I possess notes, resulted in 12 deaths, 1 cure, and 2 temporary improvements, while of 5 examples of injection with tincture of iodine, 2 were cured, and 3 died. Hence, further efforts in these directions should be abandoned. Of 6 instances of aspiration, 3 were cured, 2 improved, and 1 died of a cause not connected with the operation.

We have thus seen that aspiration is a perfectly safe procedure; that lumbar nephrotomy yields fewer deaths by 15.91 per cent. than does lumbar nephrectomy; and that the latter operation is safer by 16.17 per cent. than is the ventral operation. Hence, in cases of hydronephrosis, lumbar aspiration, repeated if it be necessary several times, should first be resorted to. In the event of its failure, nephrotomy should then be practised. Should an annoying urinary fistula result, the kidney may be removed through the loin, as a final resource.

4. *Cysts.*—For cysts of various kinds, the kidney has been removed 15 times,[2] with 8 recoveries and 7 deaths, or a mortality of 46.66 per cent. With one exception, all the operations were ventral, and the cause of death was peritonitis in 2 cases, and shock, infarction of the lungs, secondary hemorrhage, septicæmia, and pyæmia, each in 1 case.

Nephrotomy for cysts has been done in 7 cases[3] by the ventral method, all of which recovered, and in Mr. Thornton's case, both kidneys were drained. These results speak for themselves. Nephrotomy should always be tried at the outset, unless it be deemed wise to first resort to the simpler remedy, aspiration. Should nephrectomy unfortunately be decided upon,

[1] The operators were Czerny in 3 cases; Simon and Weir, each in 2 cases; and Ahlfeld, Baum, Cabot, Kœnig, Le Dentu, Landau, Leisrink, Morris, Pernice, Peters, Savage, Schramm, Spiegelberg, Svensson, Taylor, Tuckwell, Sir Spencer Wells, and Winckel, each in 1 case.

[2] The operators were Bardenheuer, Burgess, Campbell, Claus, Czerny, D'Antona, Esmarch, Getz, Keeling, Landi, Leopold, Maclean, Meadows, Ollier, and Walter. The case of Spiegelberg is omitted, as the removal was incomplete. It was a ventral operation, and death ensued from shock.

[3] The operators were Tait in 5 cases, and Thornton and Heusner, each in 1 case.

the same rule should guide us as in nephrectomy for hydronephrosis, since it is probable that all cysts can be removed by the loin after previous drainage.

5. *Painful Floating Kidney.*—Floating kidneys have been extirpated 22 times,[1] with 13 recoveries and 9 deaths, or a mortality of 40.90 per cent. Of 19 ventral operations, 11 were cured, and 8, or 42.10 per cent., succumbed, while of 3 lumbar operations, 2 recovered, and 1, or 33.33 per cent., died. Although not strictly a lumbar operation, Polk's fatal case of extirpation of a floating solitary kidney is included in the latter class, as the incision was extraperitoneal. The cause of death in the 8 fatal cases was peritonitis in 4, uræmia in 2, and septic peritonitis and shock, each in 1 case.

Nephrorraphy has been practised 18 times,[2] with 1 death, or a mortality of 5.55 per cent. The operation, however, utterly failed to fix the kidney in 4 of the survivors, and in 3 the success was only partial. Hence, although it has not afforded relief in 43.33 per cent. of all cases, its comparative freedom from danger warrants the conclusion that nephrectomy should never be performed for a movable kidney until mechanical appliances and stitching the organ to the posterior abdominal wall have failed to relieve suffering. In this event it may be removed, as has been successfully done by Gilmore and Jurié; and, although the ventral operation may be easier, especially if there happens to be a long mesonephron, its high rate of mortality from peritonitis should induce the surgeon to select the lumbar incision, through which the organ may almost invariably be readily removed.

6. *Malignant Growths.*—Carcinomatous and sarcomatous kidneys have been extirpated in 49 cases, of which 19 recovered, and 30, or 61.22 per cent., died. Of 37 ventral operations, 13 recovered, and 24, or 64.86 per cent., succumbed, while of 11 lumbar operations, 6 survived, and 5, or 45.45 per cent., perished. Of the survivors, there were recurrence and death in 7, 1 died of an unknown cause, 1 was alive with recurrence, 7 remained well for twenty-eight months and a half on an average, and 3 were living for periods varying from three weeks to two months after operation, whence they are scarcely available for the determination of the final result. In a general way it may, therefore, be said that 61.22 per cent. of all cases die as the direct result of the procedure; that 16.32 per cent. perish subsequently; that 12.24 per cent. appear to make a permanent recovery; and that the lumbar incision is far less dangerous than the ventral. In order,

[1] The operators were Martin in 8 cases; Langenbuch in 2 cases; and Billroth, Boothby, Gilmore, Hennig, Jurié, Lane, Martini, Merkel, Navratil, Polk, Smyth, and Stimson each in 1 case.

[2] The operators were Hahn in 5 cases; and Agnew, Bassini, Ceccherelli, Dunning, Esmarch, Gardner, Gilmore, Jurié, Kuester, Newman, Svensson, Von Bergmann, and Weir, each in 1 case.

however, that the true value of nephrectomy for malignant disease may be properly estimated, it is necessary that sarcoma and carcinoma be examined separately.

The kidney has been removed for sarcoma 33 times,[1] with 14 recoveries and 19 deaths, or a mortality of 57.57 per cent. Of 26 ventral operations, 11 recovered, and 15, or 57.69 per cent., died, while of 7 lumbar operations, 3 recovered, and 4, or 57.14 per cent., perished. The cause of death was shock in 7, hemorrhage and septic peritonitis, each in 3, septicæmia and exhaustion, each in 2, and pulmonary embolism and tetanus, each in 1. Of the 14 survivors, 6 subsequently died, 1 from an unknown cause, and 5 from metastases at the expiration, respectively, of five months, five months and three weeks, six months, nine months, and eighteen months, while 1 was living with recurrence at the end of four months, and 5 were alive and well at the end, respectively, of seventeen, twenty-two, and twenty-three, and thirty-five months, and five years, the cases being those of Billroth, Lossen, Thornton, Bardenheuer, and Martin. In the remaining 2 cases the history terminates with the mere statement that the patient recovered. In other words, 57.57 per cent. died as the direct result of the operation, while, of the survivors, 42.85 per cent. died subsequently, and 35.71 per cent. remained well for thirty-one months and a half on an average.

The ages of 16 of the subjects ranged between sixteen months and seven years. Of these 16 children, 7 survived, and 9, or 56.25 per cent., perished. Of the 7 survivors, the patient of Kœnig was living with recurrence at the end of four months, while the patients of Bardenheuer, Godlee, Jessop, and Hicquet died of recurrence, respectively, in five, six, nine, and eighteen months. In the remaining 2 there is no further history. In 2 of the deaths, secondary deposits were found in other organs. The remaining 17 patients were adults. Of these, 7 recovered, and 10, or 58.82 per cent., died. Of the survivors, 1 died from an undetermined cause; 1 died from metastasis; and 5 were well at the end of thirty-one months and a half on an average. From these data we may conclude that nephrectomy for sarcoma in children should not be repeated, but that in adults it is eminently justifiable, as it apparently cures 29.41 per cent. of the cases. Should the tumor be small, the lumbar incision is the preferable one.

[1] The operators were Czerny in 6 cases; Bardenheuer in 3 cases; Kœnig in 2 cases; and Billroth, Bantock, Barker, Godlee, Heath, Hicquet, Hueter, Jessop, Kocher, Little, Lossen, Martin, Meredith, Morris, Ollier, Rawdon, Réczey, Schœnborn, Tait, Thornton, Von Bergmann, and Whitehead, each in 1 case. Langenbuch's case of recovery after the lumbar incision is omitted, as the organ, converted into a cyst, was thrown away, and could not be examined. The fatal cases of Kocher, Israel, and Thiersch are also omitted, as the adhesions were so great that the diseased kidneys were not removed. Trendelenburg also opened the belly, but the extreme vascularity of the tumor prevented him from attempting its removal. The child recovered.

Nephrectomy for carcinoma has been practised in 14 cases,[1] of which 4 recovered, and 10, or 71.42 per cent., perished. All of the 9 abdominal sections, with 1 exception, were fatal, 1 of the 4 lumbar operations died, and 1 died, the nature of the operation being unknown. The cause of death was determined in 9 cases, of which 2 each were due to uræmia, shock, and peritonitis, and 1 each to metastasis, exhaustion, and anuria, the opposite kidney being cystic and contracted. Of the 4 survivors 2 died of secondary growths at the expiration, respectively, of forty-four days and two months, and the remaining 2 were alive at the end, respectively, of two months and thirteen months. Hence, carcinoma should be excluded from the category of cases for which nephrectomy should be done.

In 2 other cases the kidney has been extirpated by the ventral operation for malignant disease. The case of Wolcott, one probably of medullary carcinoma from the age of the patient, who was fifty-eight years old, died of exhaustion, while that of Byford was living at the end of twenty-eight months. As the subject was thirty-six years of age, the disease was probably sarcomatous. Hence, these additional cases of malignant disease confirm our conclusion that nephrectomy is indicated in sarcoma of adults, and contraindicated in carcinoma.

7. *Other Neoplasms.*—Czerny removed an adenomatous kidney of a child eleven months of age by the ventral operation, and death ensued from septic peritonitis. Thomas and Bruntzel succeeded in saving their patients after laparotomy for fibroma of the capsule of the kidney; and Billroth operated successfully through the loin for papilloma. Peaslee removed a "solid" tumor by laparotomy, but the patient died of peritonitis. For benign tumors, 4 nephrectomies indicate, therefore, 3 recoveries and 1 death, or a mortality of 25 per cent., so that the operation is eminently justifiable.

8. *Calculus.*—The otherwise healthy kidney has been extirpated for calculus by Czerny, Kosinski, and Morris. All of the patients recovered, 2 of the operations having been performed through the loin, and 1 through the belly. Despite these favorable results, no prudent surgeon will sacrifice the organ until all methods of exploration, including incision of the kidney itself, have failed to detect the concretion. When the organ is not dilated by pus or urine, in other words, when its secreting power is not materially damaged, the only operation that is at all justifiable is nephrolithotomy, an operation of which I have a record of 21 cases.[2] Of these, 2, or 9.52 per cent., died—the patient of Cullingworth from the

[1] The operators were Adams, Albert, Czerny, Davy, Esmarch, S. W. Gross, Homans, Halsted, Lücke, Martin, Péan, Thomas, Vercelli, and Sir Spencer Wells.

[2] The operators were Thornton in 3 cases; Morris and Beck, each in 2 cases; and Butlin, Bardenheuer, May, Howse, Hill, Symonds, Anderson, Godlee, Elder, Cullingworth, Pepper, Chiene, Rouse, and Tiffany, each in 1 case.

blocking of the opposite ureter by a stone near its vesical orifice, while that of Pepper expired suddenly, in consequence probably of the effects of morphia. Thornton's cases were by the combined ventral and lumbar incision, and all recovered; but under no circumstances should any except the lumbar incision be resorted to, unless there is doubt as to which kidney is involved. In 3 of the cases the stone was removed through an incision in the pelvis of the kidney, and in 2 cases the stones weighed, respectively, nearly an ounce, and five hundred and fifty-six grains. All of the recoveries were prompt and perfect, except in the first case of Morris, who informs me that a sinus still persists, five years subsequently.

When the symptoms point to a renal calculus, the surgeon should make an exploratory operation through the loin, with a view to its detection and removal without a resort to nephrectomy. Of 23 exploratory operations, of which 3 were done by Beck, 2 each by Morris, Lucas, and Annandale, and 1 each by Gunn, Durham, Lente, Golding-Bird, Barker, Barbour, Norton, Anderson, Fowler, Powell, Thornton, Hulke, Bardenheuer, and Lawson, all recovered, the kidney having been actually incised in four. Although a stone was not detected, the procedure was absolutely free from danger, but a calculus was doubtless present in some of the cases, even though it was not found by the fingers and acupuncture. Hence, we may conclude, with Morris, that in calculus of an otherwise healthy kidney, the organ should be incised after the failure of the ordinary methods of exploration, and thoroughly examined with the finger, before it is condemned to removal.

9. *Ureteral Fistulæ.*—For urinary fistulæ communicating with the exterior of the abdomen, the vagina, or the uterus, and due to wounds or injury of the ureter in ovariotomy and hysterectomy, to the use of the forceps in labor, and in one instance to a suicidal attempt, the kidney has been removed 12 times,[1] with 9 recoveries, and 3 deaths, or a mortality of 21.27 per cent. The cause of death was collapse in 2, and uræmia from disease of the opposite kidney in 1. Of the 11 lumbar operations, 3, or 27.27 per cent. succumbed, while the single abdominal operation recovered.

Although it seems a pity to remove a functionally active organ, yet the constant escape of urine in this class of cases is a source of so much discomfort and disgust that it is the only resource. The lumbar incision is, of course, the preferable one.

10. *Injury to the Ureter and Kidney.*—During the removal of a retroperitoneal cystic tumor by laparotomy, Thornton wounded the ureter, and at once extirpated the kidney with success. Bardenheuer met with the same accident during hysterectomy for carcinoma, and removed the kidney through the loin, but the patient died of collapse. Archer lacerated the kidney during ovariotomy, and extirpated it successfully on

[1] The operators were Albert, Billroth, Boeckel, Credé, Czerny, Le Fort, Novaro, Simon, Starck of Dantzic, Starck of London, Thornton, and Zweifel.

account of hemorrhage. In an example of rupture of the ureter with the formation of a urinary abscess in a child forty-four months of age, Barker removed the kidney through the loin, and the patient recovered. He informs me, however, that at the end of four months the child was dying from general tuberculosis. In these four cases the kidney was perfectly normal, and as its removal was complicated in three by simultaneous severe operations, the slight mortality is simply wonderful. In a fifth case, Rawdon extirpated the kidney through the loin, on account of subcutaneous laceration, and the patient expired on the fortieth day from suppuration of the opposite kidney. In three examples of protrusion of the kidney through a wound in the loin, in two of which it had been incised, Brandt, Marvaud, and Hamilton successfully removed the organ.

Agnew refers to a case in which, after the accidental division of the ureter in ovariotomy, the renal end was secured in the abdominal wound, and a urinary fistula established. The patient died, at the expiration of several months, of severe obstruction of the duct. In removing the uterus for carcinoma, Henry Morris excised half an inch of the ureter, and fixed its renal extremity in the vagina. The formation of a urinary fistula was, however, prevented by the death of the patient.

While Agnew and Morris recommend the establishment of a urinary fistula when the ureter is wounded in removing an abdominal tumor, we consider their proposal as being one of very questionable value, unless, after the formation of the fistula, nephrectomy be performed to rid the patient of a source of great discomfort and annoyance. The fixing of the renal end of the ureter in a wound made in the loin, would certainly lessen the risks of death from shock, which occurred once in the two cases of combined laparotomy for abdominal tumors and nephrectomy. Hence, in this class of injuries, we believe that nephrectomy should not be performed as a primary operation.

Should the kidney be badly lacerated during the removal of abdominal tumors, and the hemorrhage be troublesome, the organ will have to be removed, as was done by Archer. Subcutaneous rupture of the ureter, followed by the formation of a urinary abscess, demands extirpation of the kidney; but we require more experience to determine the proper course to pursue in subcutaneous laceration of the kidney. Nephrotomy and drainage should probably be tried before the kidney is excised. When the kidney protrudes through a wound in the loin, provided it can be returned, and it is not materially injured, primary nephrectomy should not be performed.

11. *Unclassified Lesions.*—With a view to completing the statistics of nephrectomy, it may be stated that three lumbar operations have been performed by Durham, Bardenheuer, and Langenbuch, of which two recovered. In the case of Durham, which proved fatal from pyæmia, the kidney was painful, but healthy. Bardenheuer's case was supposed to be one

of calculus, the patient having suffered from renal colic and hæmaturia; while in that of Langenbuch, performed for supposed sarcoma, the kidney was converted into a sac, and was accidentally thrown away before its true nature could be determined. In two additional operations, done through the belly, Billroth and Sir Spencer Wells removed a sound kidney attached to a uterine growth. Both patients died.

From a careful analysis of all the facts pertaining to the surgery of the kidney contained in this paper, based as it is upon a study of nearly four hundred and fifty cases of different operations, I believe that I am justified in formulating the following propositions for discussion:—

1. That lumbar nephrectomy is a safer operation than abdominal nephrectomy.

2. That primary extirpation of the kidney is indicated, first, in sarcoma of adult subjects; secondly, in benign neoplasms at any age; thirdly, in the early stage of tubercular disease; fourthly, in rupture of the ureter; and, lastly, in ureteral fistula.

3. That nephrectomy should not be resorted to until after the failure of other measures, first, in subcutaneous laceration of the kidney; secondly, in protrusion of the kidney through a wound in the loin; thirdly, in recent wounds of the kidney or of the ureter, inflicted in the performance of ovariotomy, hysterectomy, or other operations; fourthly, in suppurative lesions; fifthly, in hydronephrosis and cysts; sixthly, in calculus of an otherwise healthy kidney; and, finally, in painful floating kidney.

4. That nephrectomy is absolutely contraindicated, first, in sarcoma of children; secondly, in carcinoma at any age, unless, perhaps, the disease can be diagnosticated and removed at an early stage; and, thirdly, in the advanced period of tubercular disease.